

REMARKS/ARGUMENTS

By this Amendment, Applicants have amended claims 11 and 13. Claims 11-14 are pending.

OBJECTION TO DRAWINGS

The Examiner objected to "FIG. 5", and indicated that it should be "FIG. 5A". Applicants have made the requested change to the Figure in a copy attached hereto. Applicants respectfully submit that the objection to the drawings should now be withdrawn.

CLAIM REJECTIONS UNDER SECTION 102

Claims 11-14 stand rejected under 35 U.S.C. §102(b) as anticipated by Hoebener; and claims 11-14 stand rejected under 35 U.S.C. §102(b) as being anticipated by Crafts. By this Amendment, Applicants respectfully traverse the Section 102(b) rejections.

Claims 11 and 13 are independent claims, with claim 12 dependent on claim 11 and claim 14 dependent on claim 13.

Turning first to independent claim 11, it is directed to an interconnect structure for a semiconductor chip and includes the following elements:

- **a nonreflowed solder assembly including:**
- a Pb-rich ball attached to the semiconductor chip and having an exposed surface, and
- a thin layer of Sn on the exposed surface of the Pb-rich ball,
- **the Sn layer being sufficiently thin and having a melting temperature lower than that of Pb** so that Sn from the thin layer and Pb from the ball are diffused and intermixed after reflowing and annealing to form an assembly having a weight composition of about 97/3 Pb/Sn.

Applicants respectfully submit that claim 11 as amended includes a nonreflowed solder assembly with a Pb-rich ball and a thin layer of Sn on an exposed surface of the Pb-rich ball.

Claim 11 goes on to require that the Sn layer be sufficiently thin and have a melting temperature lower than that of Pb so that there is diffusion and intermixing of the Sn and Pb after reflowing and annealing. Applicants respectfully submit that this structure is neither taught nor suggested in the Hoebener and Crafts Patents.

The Office Action at page 3 discounts several features of Applicants' interconnect structure as being process requirements and not structural requirements. Applicants have amended claim 11 to more clearly define the structural features of the interconnect structure by more specifically defining a nonreflowed solder assembly and by more specifically defining the Sn layer on the Pb-rich ball. It is Applicants' contention that as amended, the Hoebener and Crafts Patents do not teach or suggest this structure.

The Hoebener Patent is directed to fine pitch solder deposits on printed circuit boards and products created thereby. In the method and product of Hoebener, low melting point solder suitable for reflow connection of components is formed on select contacts of a printed circuit board. The method of Hoebener is particularly suited for fabrication of printed circuit boards having fine pitch devices including flip-chip devices, connected on a board including conventional coarse pitch surface melted components. The fine pitch contacts of the board are exposed through holes in a stencil characterised in its ability to withstand solder reflow temperatures. In particular, the Office Action focuses on the fine pitch ball or bump 12 shown in Figures 4, 5, 11 and 12 of the Hoebener Patent. But nowhere in the Hoebener Patent is there any teaching or suggestion of the specific nonreflowed solder assembly structure defined in Applicants' claim 11.

Turning next to the Crafts Patent, it concerns a method for single mask C4 solder bump fabrication. The method of Crafts concerns removing Ball Limiting Metallurgy (BLM) layers from a surface of a wafer in the presence of Pb/Sn solder bumps. The Office Action more specifically points to the wafer substrate, electrical contact pad and metal underlay and solder bump configuration shown in Figure 8 of the Crafts Patent. In particular, Crafts Patent shows a Pb/Sn bump 17 upon the form of a solder ball 19 shown in Figure 8. But nowhere in the Crafts Patent is there any teaching or suggestion of the nonreflowed solder assembly defined in Applicants' claim 11.

Applicants have amended claim 13 in a similar manner that they amended claim 11. Thus it is Applicants' position that neither the Hoebener nor the Crafts Patents teach or suggest

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the nonreflowed solder assembly defined by Applicants' claimed invention. For the reasons stated above, Applicants request that the Section 102(b) rejections be withdrawn.

In view of the foregoing remarks and amendments, Applicants respectfully submit that claims 11-14 are in condition for allowance. Reconsideration and allowance of all pending claims are respectfully requested.

Respectfully submitted,

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Enclosure: Figures 5A (1 sheet)

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Ths M. Cooper

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